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(54) Apparatus for generating threads and the like.

(57) The invention relates to an apparatus for generating threads (66) in a work-piece (64) which is adapted to constitute a mould surface in the manufacturing of parts which are provided with threads and are manufactured from plastic or other materials which are subjected to dimensional changes.

When manufacturing work-pieces which shall constitute tools for forming threads (66) in materials which are subjected to dimensional changes it is a complicated and time consuming work to compensate the pitch of the thread (66) with regard to the dimensional changes.

In order to obviate this problem there has according to the invention been provided an apparatus for generating threads (66) and the like, which apparatus comprises a compensation device for changing the relationship between the rotation and feeding of the surface which shall be provided with a thread (66) to a predetermined degree in order to change the pitch of the thread (66) from a value supplied to the compensation device to a value which has been modified to the desired degree.

The present invention relates to an apparatus for generating threads and especially an apparatus for generating threads in a material which is adapted to constitute a mould surface in the manufacturing of threaded parts of plastic or other materials which are subjected to dimensional changes by means of moulding, for example compression moulding or injection moulding.

An apparatus of this kind comprises a device for setting up a work piece having a surface of revolution in which the thread is intended to be formed, a tool for generating a thread forming groove in the surface of revolution and a device for rotating the surface of revolution around its axis in relation to the tool and for feeding the surface in the direction of said axis and in relation to the tool for providing the pitch of the thread.

In the case that the work-piece is intended to constitute a tool for generating a thread in a material of the kind which is subjected to dimensional changes after the manufacturing, for example the compression moulding or injection moulding, it is necessary that the thread of the work-piece is provided with a pitch which is compensated or modified with regard to the subsequent dimensional changes. Such dimensional changes take place especially in plastic materials, and for example when manufacturing plastic parts by means of injection moulding there is often a linear mould shrinkage which exceeds 1 %.

It is realized that it is a complicated and time consuming work to compensate or modify the pitch of the thread with regard to the dimensional changes in the manufacturing of tools which are to be used for generating threads in materials which are subjected to dimensional changes.

Therefore, it is an object of the present invention to provide an apparatus for generating threads and the like by means of which the above problems are obviated.

5 In order to comply with said object, the apparatus according to the invention is characterized in that the device for rotating and feeding the work-piece comprises a compensation device adapted to modify to a predetermined degree the relationship between the rotation and feeding of the surface of revolution and thereby the pitch of the thread from
10 an input value to a value which is modified to a desired degree.

In a preferred embodiment of the apparatus according to the invention the device for rotating and feeding the work-piece comprises a lead screw which is connected with a stationary thread, a housing which is
15 connected with the lead screw and is displaceable along a guide, the housing being adapted to be displaced along the guide by the rotation of the lead screw, a clamping device which is rotatably journaled in the housing for holding the work-piece and a transmission device for transmitting the rotation of the lead screw to the clamping device
20 and the work-piece set up therein at a desired ratio.

Thereby said transmission device can comprise a conventional toothed wheel gearing comprising replaceable gears by means of which the desired ratio and thereby the desired compensation can be determined.
25 However, it is preferred that the transmission device comprises a device for electronically sensing the rotation of the lead screw and generating a number of pulses in relation thereto, said pulses being supplied to a computer, in which the number of pulses is modified with regard to the desired compensation and the compensated pulses are
30 supplied to a step motor which is driving the clamping device. Thereby, the desired compensation can be set directly on the computer. It is recognized that the apparatus according to the invention can be modified in order to provide a dividing apparatus wherein the same problems are present in manufacturing moulding tools for the moulding of parts of
35 a material which is subjected to dimensional changes.

The invention is described in the following with reference to the accompanying drawings.

Fig. 1 schematically shows an embodiment of an apparatus according to the invention.

Fig. 2 schematically shows an other embodiment of an apparatus according to the invention.

In Fig. 1 there is partly in section shown an apparatus according to the invention for generating a work-piece provided with threads, for example a threading electrode. In accordance with the present invention the apparatus is designed for compensating the pitch of the generated thread with regard to the dimensional changes of a material, preferably a plastic material, wherein a thread is to be formed by means of the work-piece manufactured in the apparatus according to the invention.

The apparatus according to the invention comprises a base plate 2 which supports a carrier 4 as well as a housing 8 which is displaceable along a guide 6. In the carrier 4 there is provided a nut 10 which is replaceably retained in the carrier 4 by means of a screw 12. The nut 10 is provided with an inner thread 14 which cooperates with an outer thread 16 of a lead screw 18 which is rotatably mounted in the nut 10. At its outer end the lead screw 18 is provided with a crank 20, by means of which the lead screw can be rotated. At its inner end the lead screw 18 is connected with a shaft 22 by means of a through bolt 24. The shaft 22 is journaled in the housing 8 by means of a roller bearing 26. When the lead screw 18 is rotated by means of the crank 20 the lead screw will be displaced in the axial direction because of the engagement with the nut 10, so that the housing 8 is displaced along the guide 6.

Between the lead screw 18 and the shaft 22 there is positioned a gear wheel 28 which is fixedly connected with the lead screw and the shaft. The gear wheel 28 engages a gear wheel 30 which is fixedly connected with a shaft 32 rotatably journaled in the housing. The shaft 32 is journaled in the housing 8 by means of roller bearings 34 and 36. In addition to the gear wheel 30 the shaft 32 also supports a gear wheel 38 which is unrotatably connected with the shaft. The gear wheel 38 engages a gear wheel 40 which is unrotatably supported by a shaft 42. Outside the housing 8 the shaft 42 has a portion 44 having enlarged

diameter. The shaft 42 is rotatably journaled in the housing 8 by means of roller bearings 46 and 48. In order to prevent axial play of the shaft 42 the shaft is provided with a bearing ring 50 which together with the shaft portion 44 contacts an annular portion 56 of the housing
5 2 through roller bearings 52 and 54. The bearing ring 50 is forced against the roller bearing 52 and thereby against the portion 56 of the housing by means of a nut 58 on the shaft 42 and a spring washer 60 provided between the nut 58 and the bearing ring 50.

10 The portion 44 of the shaft 42 supports a clamping device 62, for example a chuck. The clamping device 62 supports a threading electrode 64 which by means of the apparatus according to the invention shall be provided with a thread 66 having a pitch which is compensated or modified with regard to the fact that the thread 66 is to be used for
15 forming a thread in a material which is subjected to dimensional changes after the forming, for example a plastic material. The thread 66 of the threading electrode 64 is provided by means of an electrode 68 by means of which the groove forming the thread 66 of the threading electrode 64 is sparked in the threading electrode 64.

20 The rotation of the lead screw 18 is transmitted to the clamping device 62 and the threading electrode 64 through the tooth wheels 28 and 30, the shaft 32, the tooth wheel 38, the tooth wheel 40 and the shaft 42, whereby the transmission ratio between said tooth wheels
25 will determine the relationship between the rotation of the lead screw 18 and the rotation of the threading electrode 64. By using different tooth wheels in the gear unit comprising said tooth wheel it is possible to determine the relationship between the pitch of the thread 16 of the lead screw 18 and the thread 66 of the threading electrode 64.

30 In Fig. 2 there is shown another embodiment of an apparatus according to the invention. The apparatus according to Fig. 2 comprises a base plate 102, supporting a carrier 104 and a guide 106 for a housing 108. The carrier 104 comprises a nut, not shown, which is of the same kind
35 as the nut 10 of the embodiment according to Fig. 1. A lead screw 118 extends through the nut and is provided with a crank at its outer end. At its opposite end in relation to the crank 120 the lead screw 118 is rotatably but undisplacably journaled in the housing 108 providing

that a rotation of the lead screw 118 by means of the crank 120 results in a displacement of the housing 108 along the guiding 106 on the base plate 102. The housing 108 comprises a pulse generator 122 by means of which the rotation of the lead screw 118 is sensed. Preferably the end of the lead screw positioned in the housing 108 is provided with markings which are sensed by a sensor, whereupon a number of pulses corresponding to the number of sensed markings is fed from the pulse generator to a micro-processor 126 through a line 124.

10 The micro-processor 126 is adapted to convert the pulses received from the pulse generator 122 into a number of pulses which has been modified with regard to a value set on the micro-processor 126. Preferably the micro-processor 126 can with an accuracy of 2 decimals provide a percentage modification of the relationship between the number of
15 input and output pulses. The output pulses are supplied to a step motor 130 positioned in the housing 108 through a line 128, the step motor 130 thereby performing a rotational movement dependent on the number of received pulses. The step motor is connected with a chuck 132 supporting a threading electrode 164 which is to be provided with
20 a thread 166 by means of an electrode 168 in the same way as described above with reference to Fig. 1.

It is realized that the percentage modification of the rotation between the lead screw 118 and the step motor 130 and thereby the chuck 132
25 and the threading electrode 164, which modification has been set on the micro-processor 126 provides for a desired modification of the pitch of the thread 166 of the threading electrode 164 in relation to the thread of the lead screw 118.

30 It is realized that the apparatuses shown and described can be modified to constitute dividing apparatuses.

It is also realized that it is possible to generate conical threads and threads having several entrances by means of the apparatuses shown
35 and described.

An apparatus according to the invention can, of course, be included in such a machine support that the thread can be generated by means of

milling or grinding.

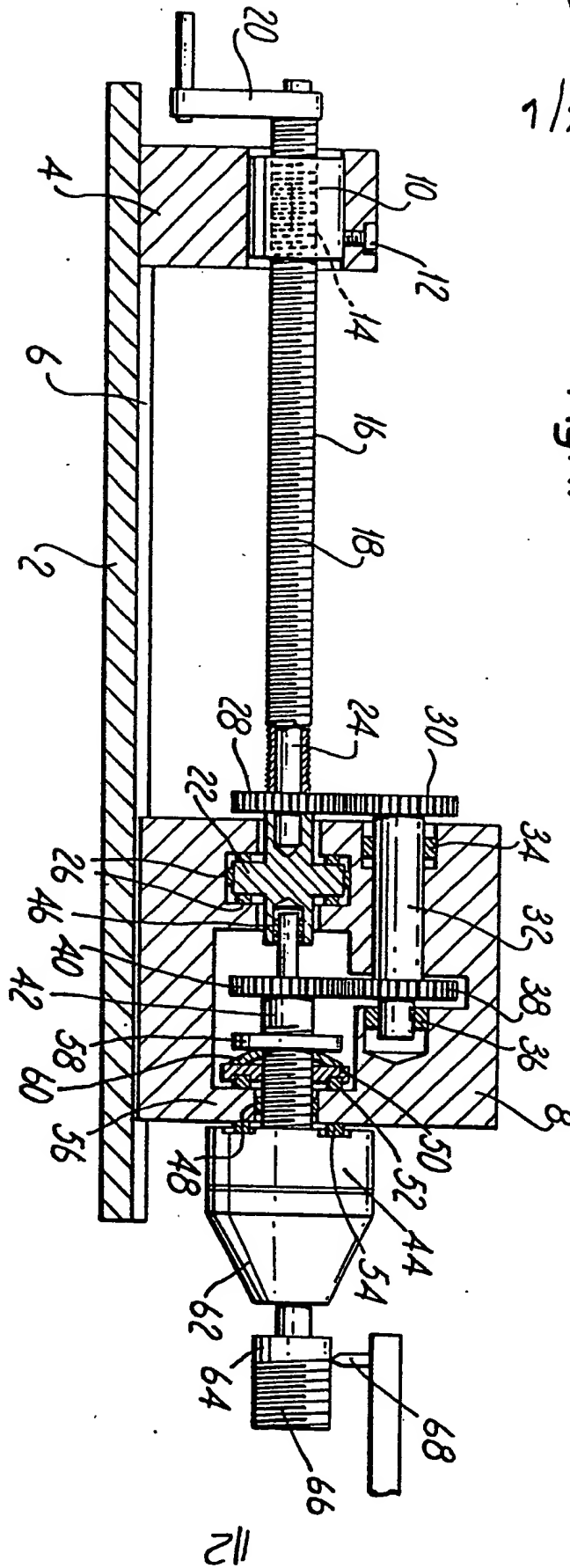
The invention can be modified within the scope of the following claims.

- 5 Thus, it is possible to use a transmission device comprising chains
and sprockets or any other kind of changing mechanism instead of the
above described gear change device and the above described electronic
apparatus in order to modify the rotation of the lead screw to the
desired, modified rotation of the clamping device supporting the work-
10 piece which shall be provided with a thread.

1. Apparatus for generating threads and the like comprising a device for setting up a work-piece having a surface of revolution in which the thread is to be formed, a tool for generating in said surface of rotation a groove for forming the thread and a device for rotating the surface of revolution around its axis in relation to the tool and for feeding the surface of revolution along said axis in relation to the tool for providing the pitch of the thread, characterized in that the device for rotating and feeding the work-piece comprises a compensation device for changing the relationship between the rotation and feeding of the surface of revolution and thereby the pitch of the thread from a value supplied to the compensation device to a value modified to a predetermined degree.
2. Apparatus as claimed in claim 1, characterized in that the device for rotating and feeding the work-piece comprises a lead screw which is connected with a stationary thread, a housing connected with the lead screw and displaceable along a guide, the housing being adapted to be displaced along the guide at the rotation of the lead screw, a clamping device which is rotatably journaled in the housing and is adapted to hold the work-piece, and a transmission device for transmitting the rotation of the lead screw to the clamping device at a desired ratio.
3. Apparatus as claimed in claim 2, characterized in that the transmission device is constituted by a gear unit.
4. Apparatus as claimed in claim 2, characterized in that the transmission device comprises a sensor for sensing the rotation of the lead screw, a pulse generator for generating pulses in dependency of said rotation, a processor for modifying the number of input pulses to a desired number of output pulses and a step motor for rotating the clamping device holding the work-piece in response to the number of output pulses from the processor.

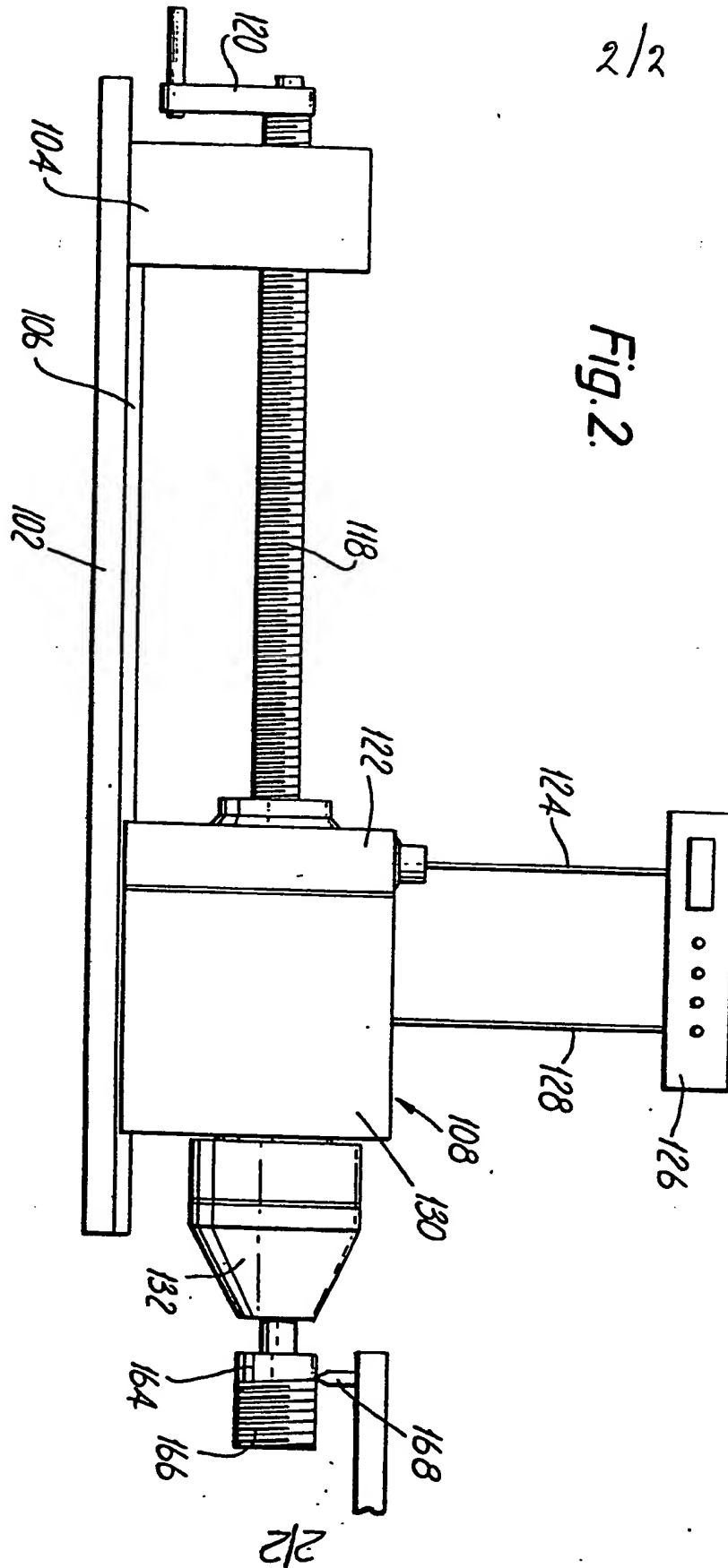
1/2

Fig. 1.



2/2

Fig. 2.



2/2



European Patent
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EUROPEAN SEARCH REPORT

0022169

Application number

EP 80 10 2947

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>CH - A - 564 994 (SCHAUBLIN)</u> * Column 1, line 35 to column 2, line 55; figures * --	1, 2, 3	B 23 G 3/00
	<u>DE - A - 2 709 776 (BERSTORFF)</u> * Page 4, line 8 to page 5, line 33; figures * --	1, 4	
	<u>FR - A - 2 154 191 (TOYODA)</u> * Page 11, lines 1 to 16; figures * ----	1, 4	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
			B 23 G 3/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			&: member of the same patent family. corresponding document
Place of search		Date of completion of the search	Examiner
The Hague		09.09.1980	HORVATH